United States Department of Agriculture

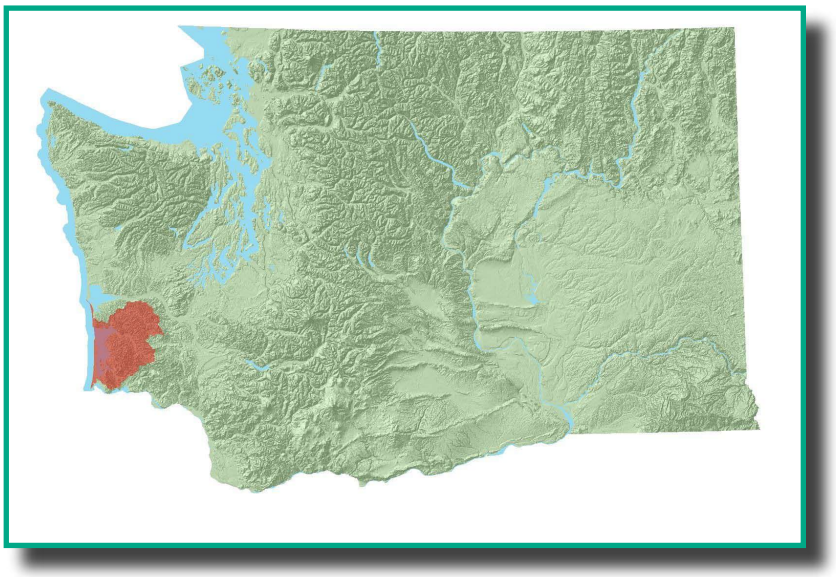
NRCS Natural Resources Conservation Service

Washington

Willapa Bay Watershed

HUC: 17100106

Rapid Watershed Assessment

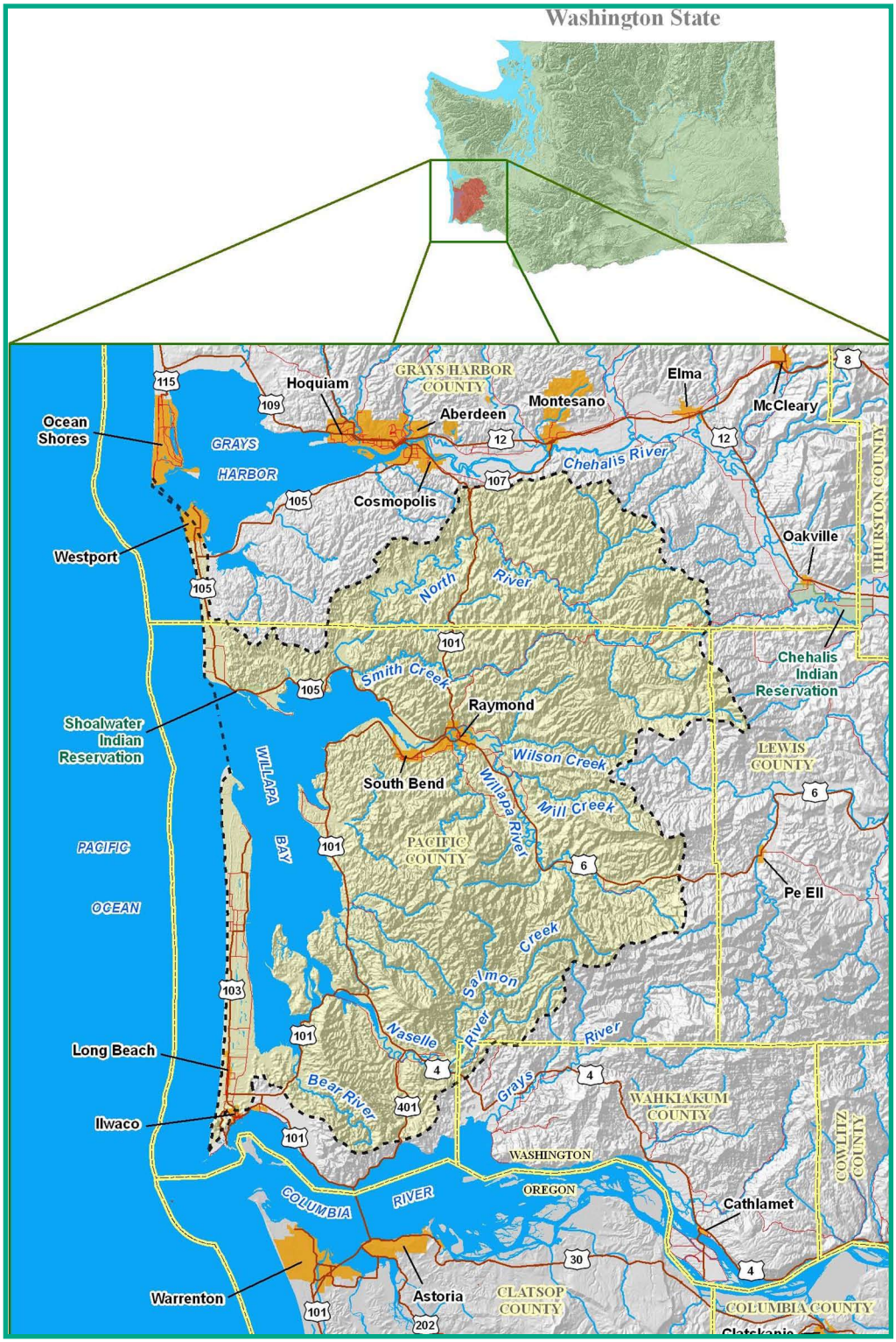


This assessment involves the collection of quantitative and qualitative information to develop a watershed profile, sufficient analysis of that information to make qualitative statements as to resource concerns and conditions, and the generation of information with which to make decisions about conservation needs and recommendations. These assessments are conducted through the use of Geographic Information System (GIS) technology and by conservation planning teams working within the watershed, meeting with landowners and conservation groups, inventorying agricultural areas, assessing current levels of resource management, identifying conservation recommendations and, making qualitative estimates of the impacts of conservation on local resource concerns.

October 19, 2006

Introduction [1]

The Willapa Bay is located in southwestern Washington State. The Willapa Bay, 8-Digit Hydrologic Unit Code (HUC) subbasin is approximately 706,087 acres in size. The watershed is 87% privately owned and 13% publicly owned. The majority of the watershed is forest, and pasture and hay. Pasture and hay is located mostly in the river bottom areas. Agricultural enterprises include cow dairy operations, hay and pasture, cranberry production and beef operations.



The cities of Raymond and South Bend make up the largest urban areas in the watershed. The watershed is mostly in Pacific County and portions of Lewis and Grays Harbor Counties are in the upper watershed.

Major resource concerns are streambank erosion, impaired water quality, forest health issues, and invasive weeds.

Primary natural resource technical assistance is provided by the South Bend NRCS Field Office, Pacific Conservation District, and Columbia-Pacific Resource Conservation and Development Area.

Content

The profile content for the Rapid Watershed Assessments in Washington is outlined in the following five categories:

The soils in the watershed are formed in a climate of high precipitation and mostly cool temperatures. The soils are generally acid and have properties associated with weathered volcanic ash, although tephra maybe absent. The soils in the higher elevations are formed in colluvium and residuum from sedimentary rock and basalt and have surface textures of medial silt loams, medial loams or gravelly medial loams. At lower elevations, are soils formed in glacial drift, marine sediments and loess and are very deep. These soils have surface textures of medial silt loams and loams. Adjacent to the shores are poorly drained soils formed on deltas and tidal flats and young soils developed from eolian sands on bars and spits.

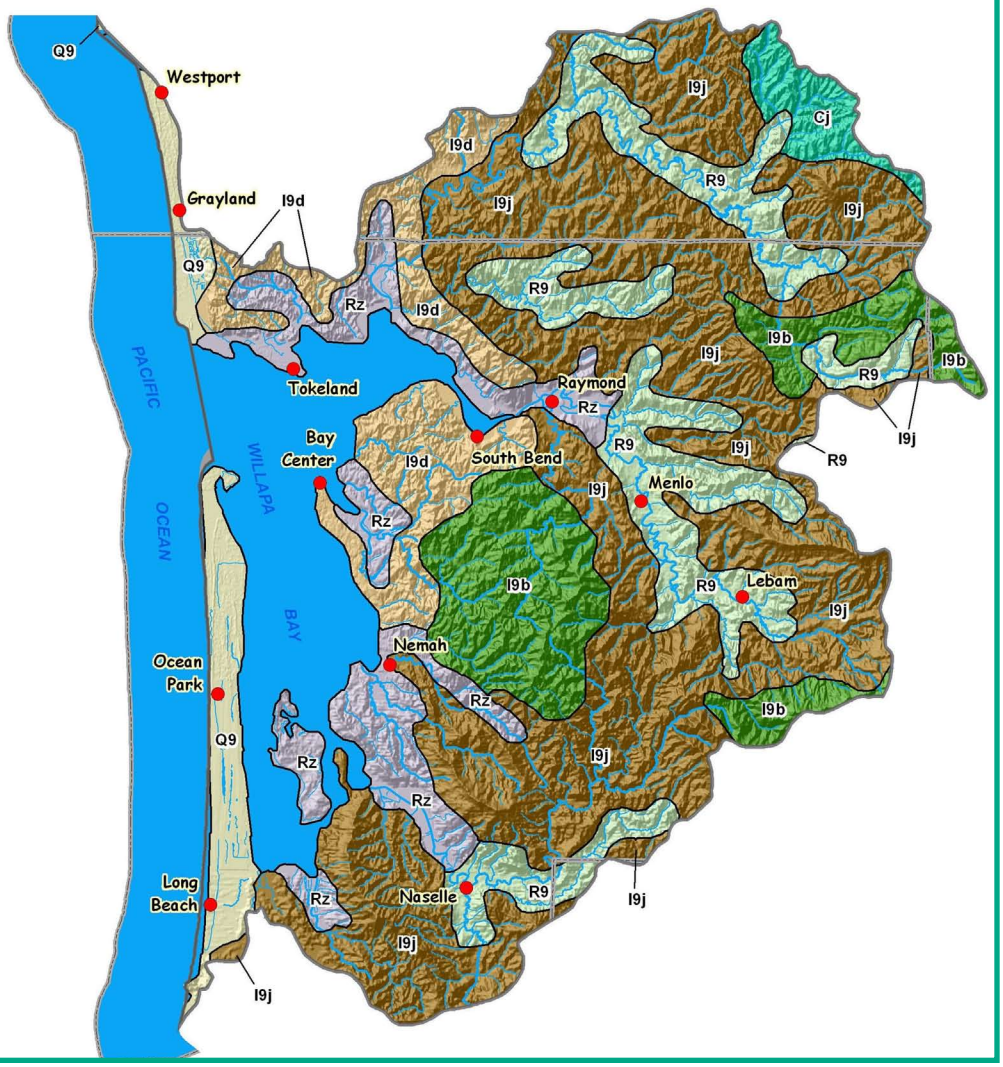
The climate pattern in this watershed provides a low risk of wind erosion although the soils are susceptible to wind and water erosion when surface residue is removed by intensive crop/forest management practices or wildfire in the lower precipitation areas.

Cj - Soils on foothills and uplands; formed on sedimentary rocks: sandstone, siltstone, or conglomerate. Xeric/ Mesic; Centralia-Melbourne-Buckpeak-Seaquest-Sauvola.

l9b - Dark-colored, humus-rich, deep soils that formed in basalt, moist year-round and have soil properties typically associated with weathered volcanic ash although tephra may be absent. Udic/Mesic-Frigid; Bunker-Zyzyl-Knappton-Boistfort-Makah.

l9d - Dark-colored, humus-rich, deep soils that formed in glacial drift and loess; soils are moist year-round and have properties typically associated with

Soils Map



(General soils descriptions continued on next page.)

weathered volcanic ash although tephra may be absent. Udic/Mesic; Hoquiam-Lebam-Willapa-Newskah.

I9j - Dark-colored, humus-rich, deep soils that formed in sedimentary rocks; soils are moist year-round and have properties typically associated with weathered volcanic ash although tephra may be absent. Udic/Mesic; Lytell-Zenker-Astoria-Elochoman-Snahopish-Solleks.

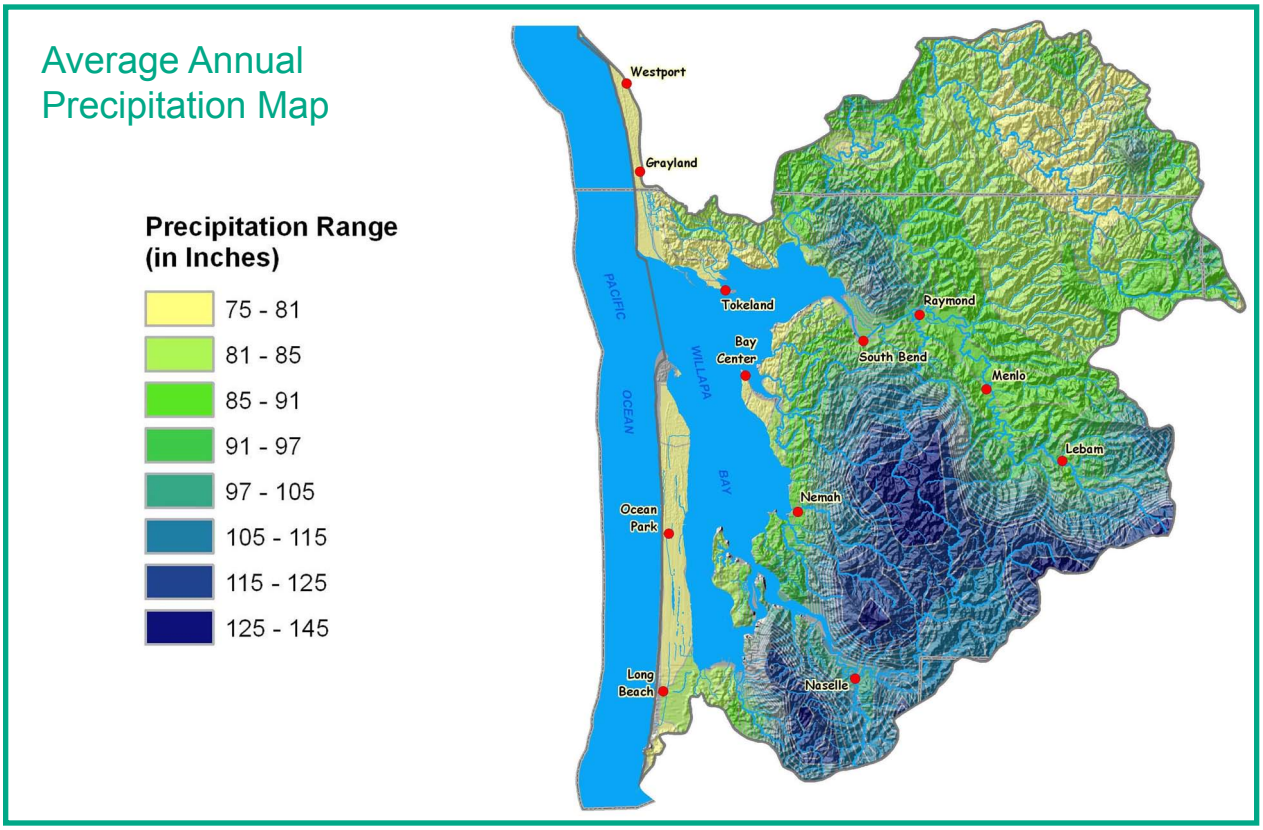
Q9 - Young soils developed in eolian sand on spits and bars in a cool, moist, windy climate; soils have subsoil accumulations of compounds of iron, aluminum, and humus; soils in swales are poorly drained. Udic/Mesic to Isomesic or Isofrigid; Yaquina-Netarts-Dune land.

R9 - Well- to poorly-drained soils that are moist year-round and have >70 inches of M.A.P. Udic to Aquic/Mesic; Grehalem-Rennie.

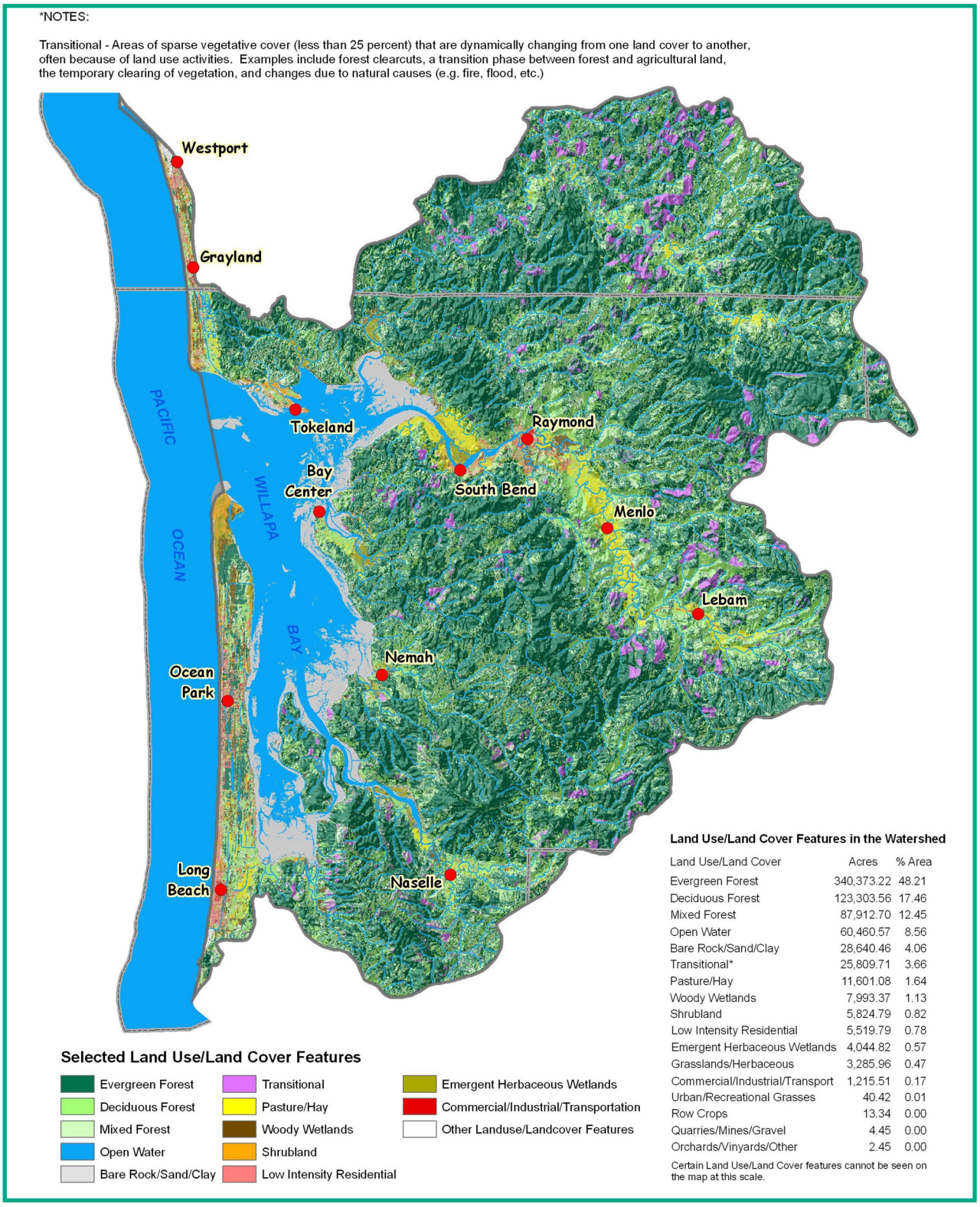
Rz - Wet, acid soils on deltas and tideflats that are less than 12 feet above sea level and are affected by tides and/or marine saltwater intrusion. Aquic/Mesic; Tacoma-Eliza-Ocosta.

Relief Map

Average Annual Precipitation Map



Landuse is a term used for a designation of a land area. NRCS uses official designations, based on use, such as cropland, forestland and rangeland. The Willapa watershed map shows the primary landuse designations; Evergreen Forest, Deciduous Forest, Mixed Forest, Open Water, and Bare Rock/Sand/Clay. These 5 major landuses make up 88% of the watershed. Minor landuses are displayed in the table.



Land Use/Land Cover Features in the Watershed

Land Use/Land Cover	Acres	% Area
Evergreen Forest	340,373.22	48.21
Deciduous Forest	123,303.56	17.46
Mixed Forest	87,912.70	12.45
Open Water	60,460.57	8.56
Bare Rock/Sand/Clay	28,640.46	4.06
Transitional*	25,809.71	3.66
Pasture/Hay	11,601.08	1.64
Woody Wetlands	7,993.37	1.13
Shrubland	5,824.79	0.82
Low Intensity Residential	5,519.79	0.78
Emergent Herbaceous Wetlands	4,044.82	0.57
Grasslands/Herbaceous	3,285.96	0.47
Commercial/Industrial/Transport	1,215.51	0.17
Urban/Recreational Grasses	40.42	0.01
Row Crops	13.34	0.00
Quarries/Mines/Gravel	4.45	0.00
Orchards/Vinyards/Other	2.45	0.00

Certain Land Use/Land Cover features cannot be seen on the map at this scale.

1.1 - Northern Pacific Coast Range, Foothills, and Valleys – Volcanic. This unit is comprised of mountains having basalt bedrock outside of the "fog belt". Temperature regime is mesic, frigid and small area of cryic. The moisture regime is udic. Vegetation is Douglas-fir and western hemlock.

1.2 - Northern Pacific Coast Range, Foothills, and Valleys - Willapa Hills. This unit is comprised of lower elevation mountains and foothills in the Coast Range. The soils are underlain by sedimentary bedrock but have silty and clayey texture throughout the profile. The soils in the Mid-Coastal Sedimentary CRA are more loamy in texture. Fragipans are present in some of the soils. Temperature regime is mesic and the moisture regime is udic. Vegetation is Douglas-fir and western hemlock.

Common Resource Area Map

4A.1 - Sitka Spruce Belt - Coastal Sedimentary Uplands. This unit is comprised of mountains having sedimentary bedrock in the coastal "fog belt". Temperature regime is isomesic and the moisture regime is udic. Sitka spruce is present and separates the unit from Northern Pacific Coast Range, Foothills, and Valleys - Volcanics CRA.

4A.2 - Sitka Spruce Belt - Coastal Lowlands. This unit is comprised of marine terraces, diked and undiked floodplains and estuaries. Temperature regime is isomesic and the moisture regime is udic.

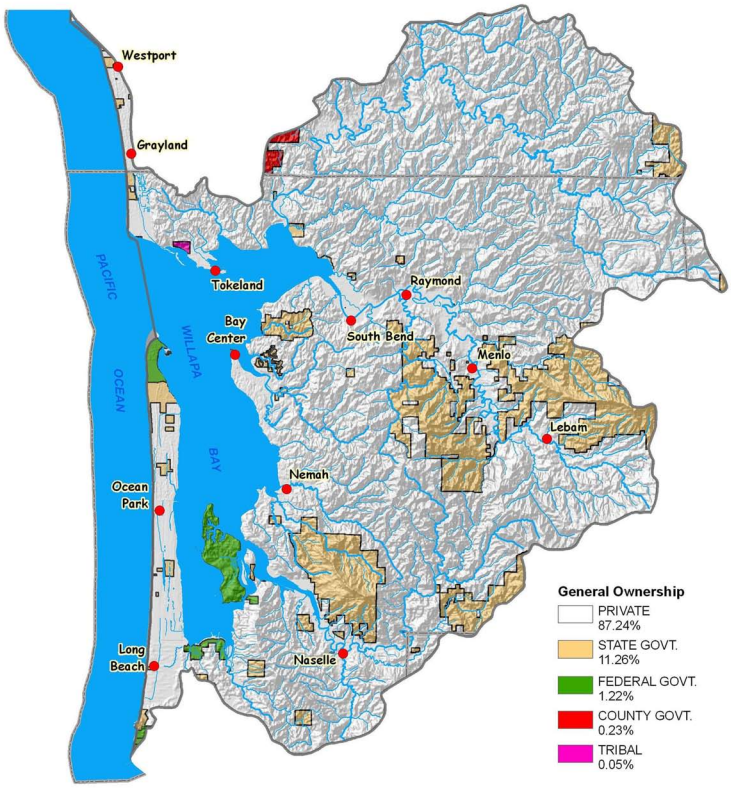
4A.3 - Sitka Spruce Belt - Coastal Volcanic Uplands. This unit is comprised of mountains having basalt bedrock in the coastal "fog belt". Temperature regime is isomesic and isofrigid and the moisture regime is udic. Sitka spruce is present and serves as an indicator for separating the unit from MLRA 1.

Physical Descriptions

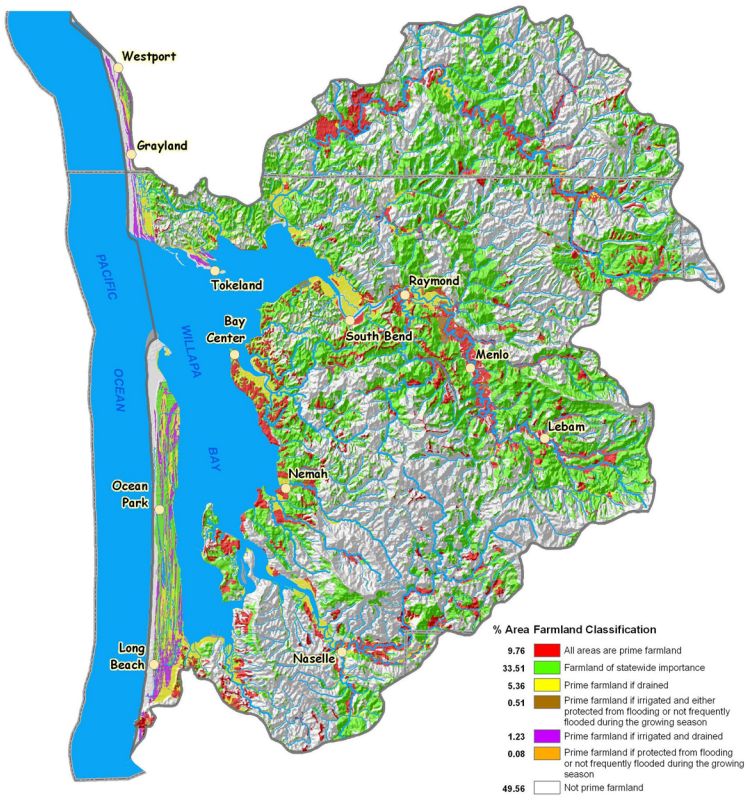
Ownership [10] and Farmland Classification [11]

Willapa Bay
706,087 Total Acres
HUC# 17100106

Ownership Map



Farmland Classification Map



Farmland Classification

The farmland classification identifies soil map units as prime farmland, farmland of statewide importance, or farmland of local importance.

This classification identifies the location and extent of the most suitable land for producing food, feed, fiber, forage, and oilseed crops.

This identification is useful in the management and maintenance of the resource base that supports the productive capacity of agriculture in this watershed.

Streams, Fish Species and Passage Barriers [7,8,9,18,19]

Statewide - these fish groups are exotic (introduced): catfish, spiny-rays (perch, sunfish, bass), pike, shad, mosquitofish, killifish, weatherfish, striped bass and goby.

Fish Group	Native	Exotic
Lamprey	3	
Minnow, carp	5	
Mudminnow	1	
Salmonid (anadromous)	5	
Salmonid (resident)	2	
Sculpin	6	
Shiner perch	1	
Smelt	2	
Starry flounder	1	
Stickleback	1	
Striped bass		1
Sturgeon	2	
Sucker	1	
Sunfish, bass, crappie		1
Watershed Total	**30**	**2**
Statewide total	53	41

Stream Statistics for the Willapa Bay Watershed	
Total streams	430
Named streams	150
Total stream miles	1262
Intermittent miles	53
Intermittent miles %	4

Willapa Watershed

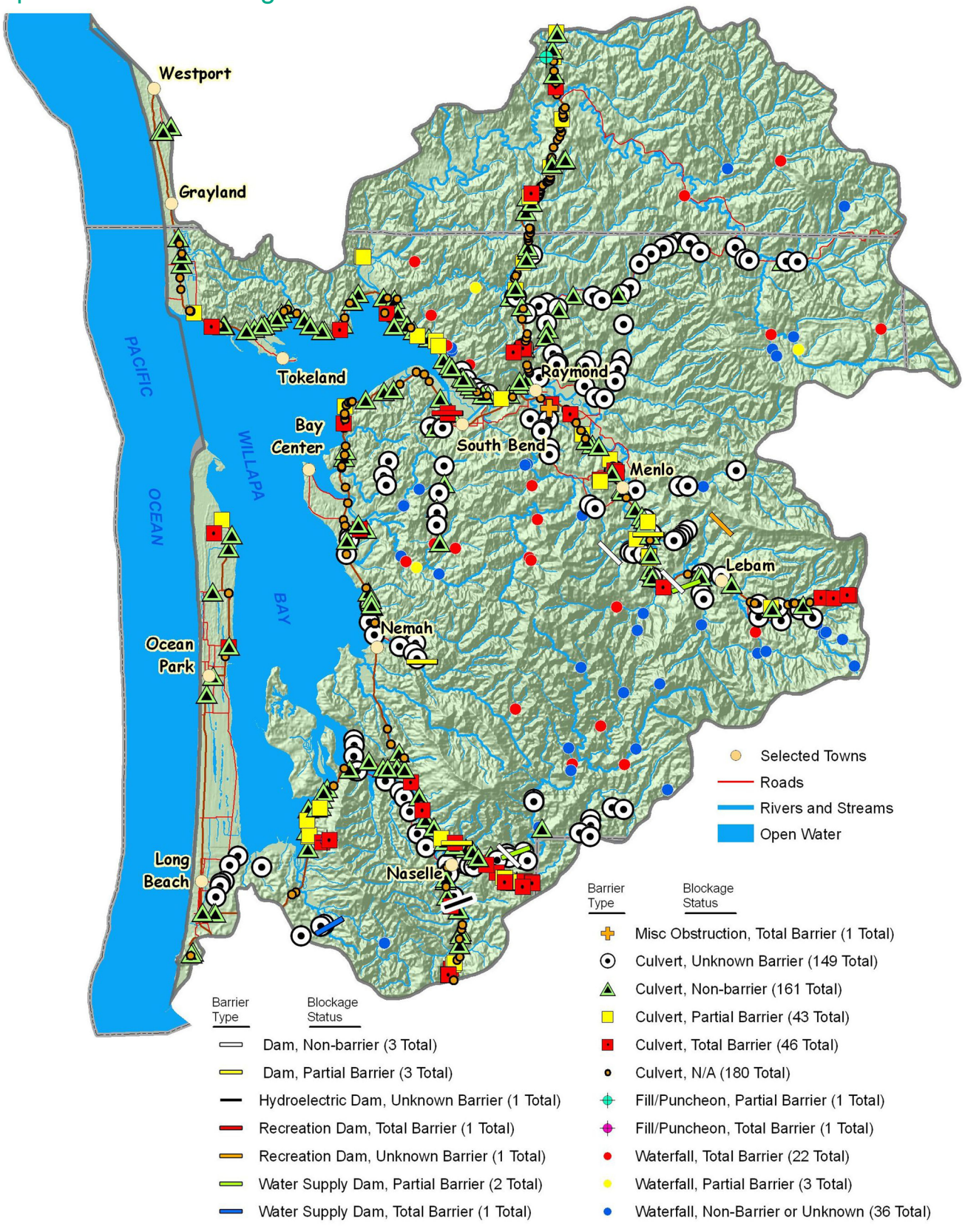
Salmonid (resident)
Native: rainbow; mountain whitefish.

Salmonid (anadromous)
Chinook, chum, coho, salmon; steehlhead, coastal cutthroat.

Only one other marine watershed has no Dolly Varden or bull trout.

(Upstream Fish Passage Barriers continued on next page.)

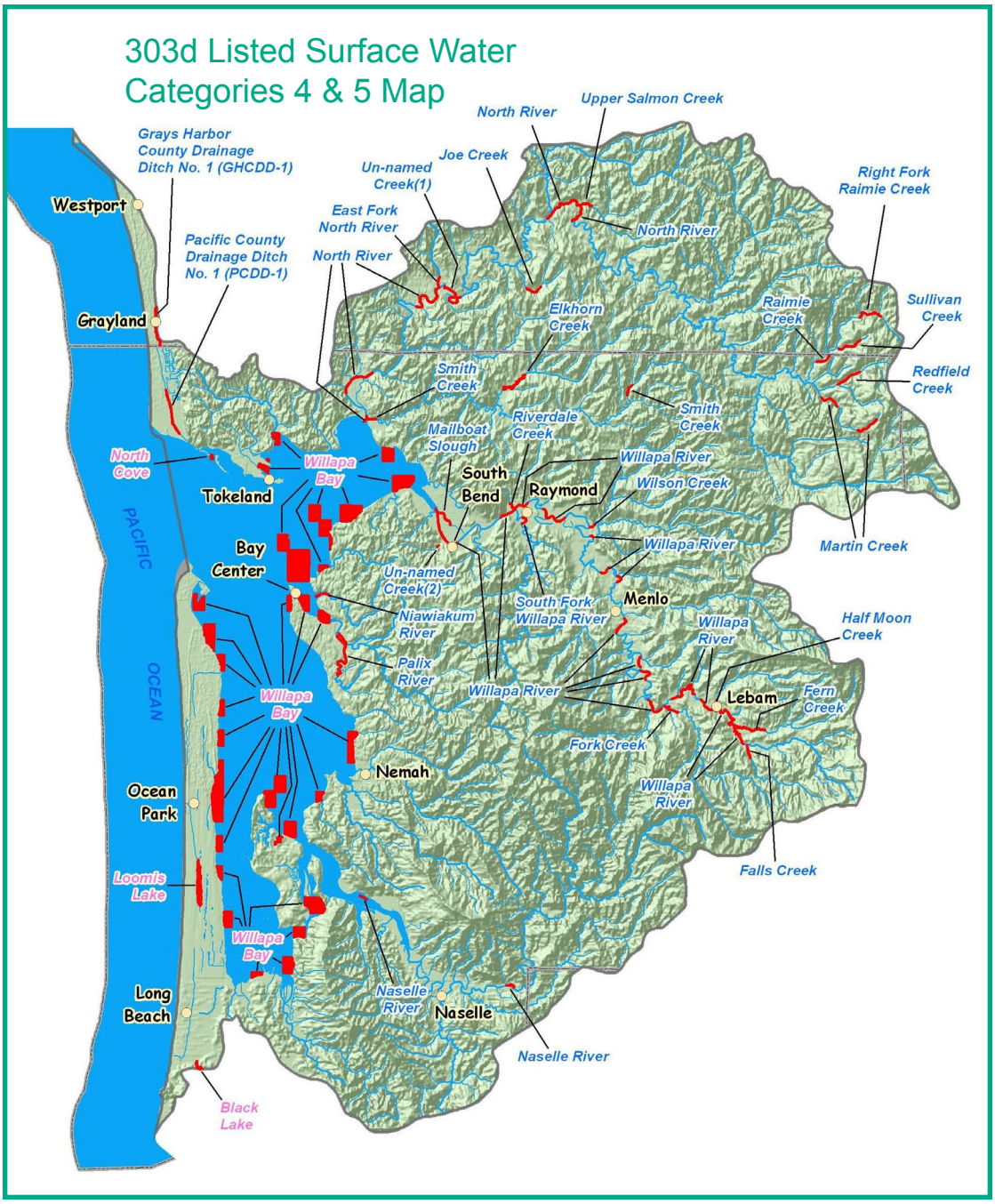
Upstream Fish Passage Barriers



303d Listed Surface Water [12]

Section 303(d) of the federal Clean Water Act requires each state periodically to prepare a list of all surface waters in the state for which beneficial uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality limited estuaries, lakes, and streams that fall short of state surface water quality standards and are not expected to improve within the next two years.

303d Listed Surface Water Categories 4 & 5 Map



Waters placed on the 303(d) list require the preparation of Total Maximum Daily Loads (TMDLs), a key tool in the work to clean up polluted waters.

TMDLs identify the maximum amount of a pollutant that can be released into a waterbody without impairing the uses of the water. TDML's can be allocated amount among various pollution sources. In addition, even before a TMDL is completed, the inclusion of a water body on the 303(d) list can reduce the amount of pollutants allowed to be released under permits issued by Ecology.

(303d Listed Surface Water continued on next page.)

Washington State's Water Quality Assessment lists the status of water quality for a particular location in one of 5 categories recommended by EPA. Categories 1 – 4 represent the status of waters for the 305(b) Report, while Category 5 represents those waters placed on the 303(d) list.

Category 4: Polluted waters that do not require a TMDL is for waters that have pollution problems that are being solved in one of three ways.

Category 4a: **"has a TMDL"** is for water bodies that have an approved TMDL in place and are actively being implemented.

Category 4b: **"has a pollution control plan"** is for water bodies that have a plan in place that is expected to solve the pollution problems. While pollution control plans are not TMDLs, they must have many of the same features and there must be some legal or financial guarantee that they will be implemented.

Category 4c: **"is impaired by a non-pollutant"** is for water bodies impaired by causes that cannot be addressed through a TMDL. These impairments include low water flow, stream channelization, and dams. These problems require complex solutions to help restore streams to more natural conditions.

Category 5: Polluted waters that require a TMDL. The 303(d) list is the traditional list of impaired water bodies. Placement in this category means that Washington State Department of Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. TMDLs are required for the water bodies in this category.

303d Listed Surface Water continued on next page.

Physical Descriptions

303d Listed Surface Water [13]

Water Body	Fecal Coliform	Temperature	Dissolved Oxygen	pH	Total Phosphorus	Exotic Invasive	Ammonia-N	Carbanyl	Arsenic	Diazinon	Pentachloro-phenol	Azinphos-Methyl	Chlophyros
Black Lake						x			x				
East Fork North River		x											
Elkhorn Creek		x											
Falls Creek	x	x	x	x			x						
Fern Creek		x											
Fork Creek	x	x	x	x			x						
Half Moon Creek		x											
Joe Creek		x											
Loomis Lake					x	x							
Mailboat Slough						x							
Martin Creek		x	x	x									
Naselle River	x	x	x	x		x	x						
Niawiakum Creek						x							
North Cove						x		x					
North River	x	x				x	x	x					
Palix Creek						x							
Raime Creek		x	x	x									
Redfield Creek		x	x	x									
Right Fork Raime Creek		x	x	x									
Riverdale Creek	x	x	x	x			x						
Smith Creek		x				x							
South Fork Willapa River		x	x	x			x						
Sullivan Creek		x	x	x									
Un-named Creek(1)		x											
Un-named Creek(2)	x	x	x	x			x						
Upper Salmon Creek		x											
Willapa Bay	x					x		x					
Willapa River	x	x	x	x			x	x					
Wilson Creek	x	x	x	x			x						
Pacific County Drainage Ditch No. 1 (PCDD-1)	x		x					x		x	x	x	x
Grays Harbor County Drainage Ditch No. 1								x		x	x	x	x

Water Body	4',4-DDT	4',4-DDD	4',4-DDE	Gamma-BHC (Lindane)	Water Column Bioassay	Endrin	Endrin Aldehyde	Endosulfan Sulfate	beta-Endosulfan	alpha-Endosulfan	2,4,6-Tri-chlorophenol	Parathion
Black Lake												
East Fork North River												
Elkhorn Creek												
Falls Creek												
Fern Creek												
Fork Creek												
Half Moon Creek												
Joe Creek												
Loomis Lake												
Mailboat Slough												
Martin Creek												
Naselle River												
Niawiakum Creek												
North Cove												
North River												
Palix Creek												
Raime Creek												
Redfield Creek												
Right Fork Raime Creek												
Riverdale Creek												
Smith Creek												
South Fork Willapa River												
Sullivan Creek												
Un-named Creek(1)												
Un-named Creek(2)												
Upper Salmon Creek												
Willapa Bay												
Willapa River												
Wilson Creek												
Pacific County Drainage Ditch No. 1 (PCDD-1)	x	x	x									
Grays Harbor County Drainage Ditch No. 1		x	x	x	x	x	x	x	x	x	x	x

Riparian Land Use / Land Cover [5]

The current condition and quality of riparian areas adjacent to water bodies is often times dependent on the land use and land cover characteristics.

This data set is based on a riparian width of 100 feet on each side of all streams in the watershed.

Land Cover/Use		
Based on a 100-foot stretch on both sides of all streams in the 100K Hydro GIS Layer	**ACRES**	**% of Buffer Area**
Bare Rock/Sand/Clay	1,896	5.4%
Commercial/Industrial/Transportation	58	0.2%
Deciduous Forest	8,747	24.9%
Emergent Herbaceous	237	0.7%
Evergreen Forest	12,454	35.4%
Grasslands/Herbaceous	353	1.0%
Low Intensity Residential	213	0.6%
Mixed Forest	6,122	17.4%
Open Water	2,035	5.8%
Orchards/Vineyards/Other	1	0.0%
Pasture/Hay	644	1.8%
Quarries/Strip Mines/Gravel	0	0.0%
Row Crops	2	0.0%
Shrubland	446	1.3%
Transitional	560	1.6%
Urban/Recreational Grasses	3	0.0%
Woody Wetlands	1,429	4.1%
Grand Total	35,203	100.0%

Irrigated Cropland, Hayland and Pastureland [14]

The Natural Resource Inventory (NRI) of 1997 was used to estimate acres of irrigated and cultivated cropland, uncultivated cropland (hayland) and pastureland in the watershed.

These estimates were then verified by the South Bend office staffs.

Irrigated Lands
1997 NRI 3 Estimates for Non-Federal Lands Only)

Type of Land	ACRES	Percent of Irrigated Lands	Percent of HUC
Cultivated Cropland	500	13%	<1%
Uncultivated Cropland	400	11%	<1%
Pastureland	2,900	76%	<1%
Total Irrigated Lands	**3,800**	**100%**	**<1%**

Cultural and Historic Sites [15]

Cultural resources are important to most residents in the watershed. Cultural Resources are considered equivalent to “historic properties” as defined in the National Historic Preservation Act. They include any prehistoric or historic district, site, building, structure or object listed in or eligible for listing in the National Register of Historic Places (maintained by the Secretary of the Interior). They also include all records, artifacts and physical remains associated with the historic properties. They may consist of the traces of all of the past activities and accomplishments of people.

Cultural resources that are also protected under other authorities (such as the American Indian Religious Freedom Act) include:

(1) tangible traces such as districts, sites, buildings, structures and objects;
(2) less tangible traces such as dance forms, aspects of folk life, landscapes, vistas, cultural or religious practices;
(3) historical documents;
(4) and some landscapes, vistas, cemeteries (if they have historic or cultural value) and life ways.

Native Americans have inhabited the area for thousands of years. Members of most of the Puget Sound and coastal tribes have utilized natural resources in this watershed. The Willapa Bay and its tributaries supported many runs of anadromous fish. This resource was a main diet for many tribes. Many cultural resource sites have been located and recorded. These sites are protected through provisions of federal and state laws. Many sites from European settlers are also located in the watershed. The type of sites found are from, homestead cabins, cemeteries and logging camps.

Activities carried out in the watershed by Federal agencies, where the agency has control of the out come, is subject to provisions of the National Historic and Preservation Act. The Act requires Federal agencies to take into account the effects of their undertakings on any cultural resources or historic properties that meet the National Register of Historic Places criteria. Part of this process involves taking action to avoid or minimize harm to eligible resources.

Air Quality, Ground Water and Wind Erosion

Resource concerns related to air quality, ground water and wind erosion are not present in this watershed.

Resource Concerns

Willapa Bay
706,087 Total Acres
HUC# 17100106

The Local Work Group (LWG) has identified the following resource concerns as being the top priority for cost share assistance:

SOIL
Road related erosion and stream sediment problems.
Streambank Stabilization of excessive bank erosion and sediment loading.
WATER
Animal mortality facility.
Animal waste storage
Buffer practice needed.
CNMP on livestock operations.
Control & collect animal wastes and contaminated runoff for storage and treatment.
Divert and/or exclude surface water runoff or contain runoff from livestock concentration areas and confined feeding areas.
Improve waste utilization & nutrient management by upgrading/improving animal waste transfer system for land application.
Irrigation system improvement and Irrigation Water Management.
Livestock exclusion needed.
Pest Management and/or mitigating practices needed on cropland or grazing land.
Pesticide use needed for production with a high risk of water contamination.
303(d) listed stream segment or tributary.
PLANT
Forest stand improvement needed.
Noxious weeds and/or woody vegetation.
Riparian Forest Buffer needed.
Existing riparian zone is enhanced.
Water development and/or cross-fencing needed to facilitate prescribed grazing.
ANIMAL
Salmonid fish passage barriers.
Listed anadromous salmonids.

Resource Concerns

Threatened and Endangered List [16,17]

The following Chart shows the listed plant and animal species under the Endangered Species Act (ESA).

These species are a resource concern that must be addressed during the planning process. For additional information contact the United States Fish & Wildlife Service (USF&W) and/or the National Marine Fisheries Service (NMFS).

If planned practices will be applied in an area where potential listed species or its designated critical habitat may be affected either positively or negatively, than a Biological Assessment (BA) must be conducted.

Animal and Plant Species Included in the Endangered Species Act for the Willipa Bay Watershed		
Common Name	**Scientific Name**	**Type**
Endangered Species		
Short Tailed Albatross	*Phoebastria Diomedea albatrus*	*Bird*
Brown Pelican	*Pelecanus occidentalis*	*Bird*
Leatherback Sea Turtle	*Dermochelys coriacea*	*Reptile*
Humpback Whale	*Megaptera novaengliae*	*Mammal*
Threatened Species		
Oregon Silverspot Butterfly	*Speyeria zerene hippolyta*	*Insect*
Bald Eagle	*Haliaeetus leucocephalus*	*Bird*
Marbled Murrelet	*Brachyramphus marmoratus*	*Bird*
Northern Spotted Owl	*Strix occidentalis caurina*	*Bird*
Western Snowy Plover	*Charadrius alexandrinus nivosus*	*Bird*
Green Sea Turtle	*Chelonia mydas*	*Reptile*
Steller Sea-lion, eastern pop.	*Eumetopias jubatus*	*Mammal*

Farm Bill Programs

Performance Results [20]

This section highlights the conservation application that has been reported from FY 2001 through FY 2006. Performance Results System (PRS) data was extracted from PRS reports by year, conservation systems by Hydrologic Unit Code (HUC). HUC reports were not available where NA. For additional information and other performance reports visit http://ias.sc.egov.usda.gov/prshome/.

	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Total
Conservation Systems									
Total Conservation Systems Planned	998	1,709	1,180	784	531	NA	214	942	6,358
Total Conservation Systems Applied	306	380	309	391	987	NA	335	254	2,962
Conservation Treatments									
Waste Management (no.)	0	2	0	1	1	0	0	0	4
Buffers (acres)	0	0	34	47	165	42	0	108	396
Erosion Control (tons/year)	0	0	0	0	0	NA	0	0	0
Erosion Control (acres treated with erosion control measures)	0	0	0	0	0	NA	0	0	0
Irrigation Management (acres)	0	0	0	0	0	0	0	0	0
Nutrient Management (acres)	274	213	148	239	508	54	0	0	1,436
Pest Management (acres)	0	0	0	0	82	0	8	105	195
Prescribed Grazing (acres)	276	404	177	0	71	0	0	0	928
Trees/Shrubs (acres)	16	83	145	270	528	133	106	311	1,592
Wildlife Habitat (acres)	0	0	234	150	165	42	152	76	819
Wetlands (acres)	0	0	184	60	0		152	0	396

This table lists the farm bill program participation in the watershed during the last five years. Data was collected from Conservation Systems Planned using Farm Bill Programs from PRS reports for the hydrologic unit area. NA indicates that the information was not available.

	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Total
Acres Planned Using Conservation Farm Bill Programs (acres)									
Conservation Reserve Program (CRP)	0	0	24	0	65	151	50	0	290
Conservation Security Program (CSP)	NA	NA	NA	NA	NA	NA	1,059	0	1,059
Environmental Quality Incentives Program - Ground and Surface Water (EQIP-GSWC)	-	-	-	-	0	0	0	0	0
Environmental Quality Incentives Program (EQIP)	0	81	175	171	0	329	0	788	1,544
Farmland Protection Program (FPP)	-	0	0	0	0	0	0	0	0
Forestry Incentives Program (FIP)	299	486	137	101	36	0	0	0	1,059
Grassland Reserve Program (GRP)	-	-	-	-	0	0	0	0	0
Wetlands Reserve Program (WRP)	0	0	294	303	430	0	114	142	1,283
Wildlife Habitat Incentive Program(WHIP)	0	0	0	0	0	0	0	12	12

Census Data - Ethnicity [22] and Economic Characteristics [23]

There are 510 farms in Grays Harbor County and 341 farms in Pacific County, the core counties comprising 100% of the agricultural operations in the watershed. An analysis of the 2002 Agricultural Census data by zip code suggests there are 251 agricultural operations in the watershed. Pacific County has 91% of the agricultural operations in the watershed. The county average farm size in the 2002 Census of Agriculture was 105 acres for Grays Harbor and 152 acres for Pacific.

For Grays Harbor County, the 2002 average market value of agricultural products sold was $58,853 with a net cash farm income of $3,062. The Grays Harbor county net cash farm income was 9% of the statewide average. For Pacific County, the 2002 average market value of agricultural products sold was $89,932 with a net cash farm income of $26,745. The Pacific County net cash farm income was 79% of the statewide average.

The average farm size for Washington State in the 2002 Census of Agriculture was 426 acres with an average market value of agricultural products sold of $148,327 and an average net cash farm income of $33,925.

Population Ethnicity by County	Grays Harbor	Pacific	Washington
White persons, percent, 2004 (a)	91.0%	93.3%	85.3%
Black persons, percent, 2004 (a)	0.5%	0.3%	3.5%
American Indian and Alaska Native persons, percent,2004 (a)	4.8%	2.4%	1.6%
Asian persons, percent, 2004 (a)	1.3%	2.1%	6.3%
Native Hawaiian and Other Pacific Islander, percent,2004 (a)	0.1%	0.0%	0.5%
Persons reporting two or more races, percent, 2004	2.3%	1.9%	2.9%
Persons of Hispanic or Latino origin, percent, 2004 (b)	5.7%	5.8%	8.5%
White persons, not Hispanic, percent, 2004	86.0%	87.9%	77.5%

Economic Chracteristics by County	Grays Harbor		Pacific		Washington	
Income in 1999	Number	%	Number	%	Number	%
Households	26,807	100	9,089	100	2,272,261	100
Less than $10,000	3,260	12	1,153	13	171,863	8
$10,000 to $14,999	2,389	9	813	9	124,848	6
$15,000 to $24,999	4,128	15	1,733	19	265,131	12
$25,000 to $34,999	3,916	15	1,438	16	284,630	13
$35,000 to $49,999	4,921	18	1,644	18	389,434	17
$50,000 to $74,999	4,883	18	1,379	15	486,392	21
$75,000 to $99,999	1,951	7	533	6	264,498	12
$100,000 to $149,999	984	4	252	3	188,513	8
$150,000 to $199,999	184	1	62	1	47,615	2
$200,000 or more	191	1	82	1	49,337	2
Median household income (dollars)	34,160	0	31,209	0	45,776	0

Willapa Bay
706,087 Total Acres
HUC# 17100106

	Grays		Pacific		Washington	
ECONOMIC CHARACTERISTICS by County	**Number**	**%**	**Number**	**%**	**Number**	**%**
Employed civilian population 16 years and over	27,556		7,989		2,793,722	
OCCUPATION						
Management, professional, and related occupations	6,684	24	2,129	27	993,198	36
Service occupations	5,440	20	1,718	22	416,056	15
Sales and office occupations	6,286	23	1,636	21	723,256	26
Farming, fishing, and forestry occupations	1,289	5	462	6	43,495	2
Construction, extraction, and maintenance occupations	3,199	12	822	10	263,767	9
Production, transportation, and material moving	4,658	17	1,222	15	353,950	13
INDUSTRY						
Agriculture, forestry, fishing and hunting, and mining	2,001	7	663	8	68,976	3
Construction	2,119	8	545	7	194,871	7
Manufacturing	3,437	13	789	10	348,646	13
Wholesale trade	722	3	151	2	113,526	4
Retail trade	3,572	13	797	10	338,772	12
Transportation and warehousing, and utilities	1,315	5	360	5	150,985	5
Information	411	2	184	2	95,669	3
Finance, insurance, real estate, and rental and leasing	1,119	4	299	4	170,622	6
Professional, scientific, management, administrative, and waste management services	1,129	4	460	6	272,466	10
Educational, health and social services	5,463	20	1,699	21	541,214	19
Arts, entertainment, recreation, accommodation and food services	2,721	10	1,009	13	221,656	8
Other services (except public administration)	1,575	6	479	6	135,379	5
Public administration	1,972	7	554	7	140,940	5
CLASS OF WORKER						
Private wage and salary workers	19,471	71	5,221	65	2,125,029	76
Government workers	5,426	20	1,813	23	459,722	17
Self-employed workers in own not incorporated	2,522	9	887	11	199,827	7
Unpaid family workers	137	1	68	1	9,144	0

Census Data - Ag Census Data [21]

2002 AG CENSUS DATA	Grays Harbor	Pacific
Farms (number)	510	341
Land in farms (acres)	53,594	51,824
Total cropland (acres)	21,928	16,949
Irrigated land (acres)	5,266	2,830
Principal operator by primary occupation - Farming (number)	256	190
Principal operator by place of residence - On farm operated (number)	420	261
Farms by Size		
Average size of farm (acres)	105	152
1 to 9 acres	71	44
10 to 49 acres	214	149
50 to 69 acres	55	29
70 to 99 acres	53	33
100 to 139 acres	46	19
140 to 179 acres	19	22
180 to 219 acres	13	10
220 to 259 acres	3	2
260 to 499 acres	18	16
500 to 999 acres	10	8
1,000 to 1,999 acres	6	4
2,000 acres or more	2	5
Livestock and Poultry		
Inventory - Cattle and calves (farms)	271	130
Inventory - Cattle and calves - Beef cows (farms)	231	104
Inventory - Cattle and calves - Milk cows (farms)	19	18
Inventory - Hogs and pigs (farms)	13	6
Inventory - Sheep and lambs (farms)	17	2
Inventory - Layers 20 weeks old and older (farms)	54	15
Inventory - Broilers and other meat-type chickens (farms)	8	2

Willapa Bay
706,087 Total Acres
HUC# 17100106

2002 AG CENSUS DATA	Grays Harbor	Pacific
Selected Crops Harvested (acres)		
Harvested cropland (acres)	13,480	7,819
Harvested cropland - Irrigated (acres)	4,014	2,584
Corn for grain (acres)	0	0
Corn for grain - Irrigated (acres)	0	0
Corn for silage or greenchop (acres)	619	0
Corn for silage or greenchop - Irrigated (acres)	524	0
Wheat for grain, all (acres)	0	0
Wheat for grain, all - Irrigated (acres)	0	0
Wheat for grain, all - Winter wheat for grain (acres)	0	0
Wheat for grain, all - Spring wheat for grain (acres)	0	0
Barley for grain (acres)	0	0
Barley for grain - Irrigated (acres)	0	0
Oats for grain (acres)	35	0
Oats for grain - Irrigated (acres)	0	0
Potatoes (acres)	23	0
Sugarbeets for sugar (acres)	0	0
Forage - land used for all hay, haylage, grass silage, and greenchop (acres)	9,084	5,892
Forage - land used for all hay, haylage, grass silage, and greenchop - Irrigated (acres)	2,543	1,071
Vegetables harvested for sale (acres)	2,152	8
Land in orchards (acres)	49	0
Land in orchards - Irrigated (acres)	7	0

A limited number of natural resource and socio-economic studies have been conducted in the Willapa Bay watershed. Many studies have been conducted in the Lower Chehalis WRIA 22. This watershed is just north of the Willapa Bay. Many of these studies have focused on water quality issues and have been conducted in cooperation with Washington Department of Ecology.

In addition, to water quality studies, the Washington Department of Natural Resources conducts studies ranging from road inventories, culvert location and Habitat Conservation Plans.

The following list and links are from the Washington Department of Ecology:

WRIA 22, Lower Chehalis

Title	Number	Date
Montesano Groundwater Investigation of Leaking Underground Storage Tanks, October 2004 and March 2005	06-03-008	January 2006
Progress on Watershed Planning and Setting Instream Flows	05-11-038	December 2005
Quality Assurance Project Plan: Saginaw Mill Groundwater Monitoring	05-03-102	February 2005
Marine Fueling and Oil Transfer Practices for Covered Vessels and Ships in Washington	04-08-005	December 2004
The Chehalis/Grays Harbor Watershed Dissolved Oxygen, Temperature, and Fecal Coliform Bacteria TMDL: Detailed Implementation (Cleanup) Plan	04-10-065	December 2004
Quality Assurance Project Plan: Montesano Groundwater Investigation of Leaking Underground Storage Tank Sites.	04-03-114	October 2004
Washington State Toxics Monitoring Program: Toxic Contaminants in Fish Tissue and Surface Water in Freshwater Environments, 2002	04-03-040	September 2004
Chehalis River Basin, WRIAs 22 and 23, Fish Habitat Analysis Using the Instream Flow Incremental Methodology	04-11-006	April 2004
Upper Humptulips River Temperature Total Maximum Daily Load: Detailed Implementation Plan	03-10-042	July 2003
Mercury in Edible Fish Tissue and Sediments from Selected Lakes and Rivers of Washington State	03-03-026	June 2003
Grays Harbor, WA Geographic Response Plan (GRP)	03-08-010	June 2003
Focus on Upper Humptulips River	03-10-041	May 2003
Effectiveness Monitoring for Dioxin Total Maximum Daily Loads in Western Washington	03-03-002	January 2003

Title	Number	Date
Grays Harbor/Chehalis Watershed Fecal Coliform Bacteria Total Maximum Daily Load Submittal Report	01-10-025	December 2002
Quality Assurance Project Plan: Screening Survey of Mercury Levels in Edible Fish Tissue from Selected Lakes and Rivers of Washington State	02-03-080	October 2002
Salmon Recovery Index Watershed Monitoring Program: Water Quality Index Report, October 2000 - September 2001	01-03-046	December 2001
River and Stream Ambient Monitoring Report for Water Year 2000	01-03-042	December 2001
Chehalis Best Management Practices Evaluation Project, 1995-2000 Temperature Monitoring Data	01-03-041	December 2001
Upper Humptulips River Temperature Total Maximum Daily Load -- Technical Report	01-10-056	September 2001
Upper Chehalis River Basin Temperature Total Maximum Daily Load	99-52	July 2001
Upper Humptulips River Watershed Temperature Total Maximum Daily Load (Water Cleanup Plan) Submittal Report	01-10-022	June 2001
Quality Assurance Project Plan: Program for Monitoring Salmon Recovery in Index Watersheds: Water Quality and Quantity	00-03-098	December 2000
Evaluation of Efforts to Reduce Pesticide Contamination in Cranberry Bog Drainage	00-03-041	November 2000
Grays Harbor Fecal Coliform Total Maximum Daily Load Study	00-03-020	June 2000
Water Quality Assessments of Selected Lakes within Washington State: 1997	00-03-009	March 2000
River and Stream Ambient Monitoring Report for Water Year 1997	99-332	August 1999
Aquatic Plants Technical Assistance Program 1998 Activity Report	99-328	June 1999
Grays Harbor Estuary Sediment Evaluation/Chemical Screening and Station Cluster Analysis of Selected	99-300	1999
Biological Assessment of Small Streams in the Coast Range Ecoregion & the Yakima River Basin	99-302	1999
Aquatic Plants Technical Assistance Program 1997 Activity Report	98-311	1998
Chehalis Best Management Practices Evaluation Project, 1997-98 Annual Report	98-316	1998
River and Stream Ambient Monitoring Report for Wateryear 1996	98-317	1998

Title	Number	Date
Washington State Marine Water Quality in 1996 and 1997	98-338	1998
River and Stream Ambient Monitoring Report for Wateryear 1995	96-355	1997
Chehalis Best Management Practices Evaluation Project, 1996-97 Annual Report	97-305	1997
Water Quality Assessments of Selected Lakes within Washington State - 1994	97-307	1997
Washington State Marine Water Quality in 1994 and 1995	97-316	1997
City of Aberdeen Wastewater Treatment Plant Class II Inspection, March 17-19, 1997	97-331	1997

Footnotes and Bibliography

All information is provided “as is.” There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.

1. Rapid Watershed Assessment (RWA) 8-digit Hydrologic Unit (HU) boundaries are from the U.S. Geological Survey huc250k vector data layer published in 1994. The data is based on the Hydrologic Unit Maps published by the U.S. Geological Survey Office of Water Data Coordination, together with the list descriptions and the name of the region, subregion, accounting unit, and cataloging unit. The hydrologic units are encoded with an eight-digit number that indicates the hydrologic region (first two digits), hydrologic subregion (second two digits), accounting unit (third two digits), and cataloging unit (fourth two digits). The HU data was downloaded from the NRCS Geospatial Data Gateway http://datagateway.nrcs.usda.gov/. Tribal reservation boundaries are from the Washington State Department of Ecology (WDOE) 1;100,000 scale State Tribal Lands vector data layer. This layer can be downloaded from http://www.ecy.wa.gov/services/gis/data/data.htm#tribal .

2. General Soils were derived from the General Soil Map, Washington (1:500,000 scale), by Maureen Boling, Bruce Frazier and Alan Busacca, Washington State University, 1998. The soil map is the product of the combined efforts of Washington State University and its National Cooperative Soil Survey Partners, the USDA Natural Resources Conservation Service and Forest Service. More information visit http://remotesens.css.wsu.edu/washingtonsoil/index.htm .

3. The Relief map was created using a seamless, statewide, 30-meter resolution USGS digital elevation model (DEM) raster clipped to the watershed boundary. This DEM was colored to represent relative relief and draped over a 30-meter hillshade grid derived from the statewide DEM to create a 3-D effect. The mountain peaks and town locations are from the 2004 USGS Geographic Names Information System (GNIS) Non-populated Places and Populated Places datasets. The GNIS data was downloaded from the NRCS Geospatial Data Gateway http://datagateway.nrcs.usda.gov/ .

4. Average Annual Precipitation is from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) raster data. This annual precipitation data is derived from the climatological period of 1961-1990. The PRISM raster data is the underlying dataset from which the polygons and vectors were created. For more information about PRISM visit http://www.ocs.orst.edu/prism/prism_new.html. Precipitation data was downloaded from the NRCS Geospatial Data Gateway: http://datagateway.nrcs.usda.gov/.

5. The Land Use/Land Cover data was generated from the National Land Cover Dataset (NLCD) compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data (where available). The data was assembled by the USGS and published in June of 1999. The analysis and interpretation of the satellite imagery was conducted using very large, sometimes multi-state image mosaics. These data can be used in a geographic information system (GIS) for any number of purposes, such as assessing wildlife habitat, water quality, pesticide runoff, land use change, etc. For more information about NLCD visit: http://landcover.usgs.gov/natllandcover.php. The data was downloaded from the NRCS Geospatial Data Gateway: http://datagateway.nrcs.usda.gov/ . For more information on Land Use designations, refer to the NRCS Planning Procedures Handbook, March 2003.

Footnotes and Bibliography

6. Common Resource Area (CRA) Map delineations are defined as geographical areas where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) map delineation or polygon. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a CRA. For more information about a CRA visit http://soils.usda.gov/survey/geography/cra.html.

7. Fish species distribution for both streams and lakes was obtained by overlaying a clear plastic outline of Washington State, with the chosen watershed highlighted, onto a similar-sized fish-distribution map found for each fish species in the publication, “Inland Fishes of Washington”. Wydoski, R. S. and R. R. Whitney. 2003. Inland Fishes of Washington (2nd edition). American Fisheries Society and University of Washington Press. 320 pp. Many fish species are shown as living only in the main stem Columbia or Snake Rivers. If one of these rivers runs through, or is a boundary of a target watershed, river-borne species were included in the watershed. Likewise, estuary-type fish such as starry flounders, that are often found well upstream from saltwater, are included in most watersheds that drain to salt water.

8. Fish barrier information was downloaded from the SalmonScape website at: (http://wdfw.wa.gov/mapping/salmonscape/). This Washington Department of Fish and Wildlife website offers an online source of maps at the 1:24,000 scale for planners to identify and prioritize their stream restoration and protection activities. The site merges fish presence and habitat data collected by state, federal, tribal and local biologists and presents it in an integrated system that can be readily accessed by other agencies and the public. It is part of the larger StreamNet program for Northwestern States.

9. Stream statistics were obtained from 1:100,000 scale StreamNet data layers found at: http://www.streamnet.org/pnwr/fileaccess.html. StreamNet (http://www.streamnet.org/) is a cooperative venture of the Pacific Northwest’s fish and wildlife agencies and tribes and is administered by the Pacific States Marine Fisheries Commission (http://www.psmfc.org/). It is recognized that a 100K map scale may show less streams and less stream miles than a 24K map, but it still gives a useful comparison between watersheds.

10. General Ownership is derived from the 1:100,000 scale Washington Public Lands (2005) layer. The layer is comprised of the best available data compiled at 1:100,000 scale. This data layer is a compilation of the Washington State Department of Natural Resources (WDNR) Managed Land Parcels layer and the Washington State Major Public Lands (Non-DNR or NDMPL) layer. The combination of these two data layers is intended to reflect the most current general ownership (and extent of public lands) digital data in Washington State at the 1:100,000 scale.

    These data layers were downloaded from the WDNR Available GIS Data website: http://www3.wadnr.gov/dnrapp6/dataweb/dmmatrix.html. The RWA map describes occurrences within the watershed of land ownership/management areas for federal, tribal, state, local and private entities. For current ownership status, consult official records at appropriate Federal, State, and county offices.

Footnotes and Bibliography

11. Farmland classifications were derived using the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) tabular and spatial data. This information can be referenced through the NRCS Field Office Technical Guide, Section II, Soils: soils data and interpretation databases. The following surveys were used:

    Grays Harbor County Area, Pacific and Wahkiakum Counties, WA
    (WA627) Published 2004 10 07
    Lewis County, WA (WA641) Published 2005 03 04

    These surveys and tabular databases were downloaded from the NRCS Soil Data Mart at http://soildatamart.nrcs.usda.gov. Farmland classification layers were created using the soil surveys in the NRCS Soil Data Viewer (SDV). Visit the online Web Soil Survey at http://websoilsurvey.nrcs.usda.gov for official and current USDA soil information as viewable maps and tables.

12. Washington Department of Ecology:
    http://www.ecy.wa.gov/programs/wq/303d/wq_assessment_cats.html.
    Washington State Water Quality Categories website:
    http://apps.ecy.wa.gov/wats/WATSQBEHome.asp (In the first drop-down box, click on your WRIA of interest.)

13. 303d listed streams were derived from the Washington State Department of Ecology's (WDOE) 2004 Washington Water Quality Assessment/303(d) List. This information was downloaded from the WDOE Statewide Datasets website: http://www.ecy.wa.gov/services/gis/data/data.htm.

14. ESTIMATES FROM THE 1997 NRI DATABASE (REVISED DECEMBER 2000) REPLACE ALL PREVIOUS REPORTS AND ESTIMATES. Comparisons made using data published for the 1982, 1987, or 1992 NRI may produce erroneous results. This is because of changes in statistical estimation protocols and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected. All definitions are available in the glossary. In addition, this December 2000 revision of the 1997 NRI data updates information released in December 1999 and corrects a computer error discovered in March 2000.
    For more information: http://www.nrcs.usda.gov/technical/NRI/ .

15. NRCS General Manual, Part 401 - Cultural Resources (Archeological and Historic Properties) http://policy.nrcs.usda.gov/scripts/lpsiis.dll/GM/GM_420_401_a.htm .

16. USFWS website for all federally listed animals and plants in Washington State. http://ecos.fws.gov/tess_public/StateListing.do?state=WA&status=listed .

Footnotes and Bibliography

17. Washington State's Rare Plant Species Populations and Endangered Ecosystems from the Washington Natural Heritage Program WNHP (Current and Historic) Data Set (September 2005). In designing the WNHP Data Set, Washington Natural Heritage Program sought to license and distribute a GIS data set for use in land use planning and management. In order to balance the interests of data users with species protection, the precise locations of rare plant populations are not included. These locations are instead represented by 'areas-of-concern'. Occurrences of species considered critically imperiled are generalized as larger areas-of-concern polygons. Some known element occurrences have been completely removed from this data set before distribution because information on these elements is considered sensitive at this time. For more information please visit the WNHP website at www.dnr.wa.gov/nhp.

18. ESA-listed bull trout population delineations (termed by USFWS as a DPS, or Distinct Population Segment) were obtained from the following 1:100,000 scale StreamNet data layer: sp1498_Bulltrout_ Icc. Similar information can be viewed in the Federal Register publication of the USFWS, 50 CFR Part 17, "Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout; Final Rule" September 26, 2005; page 56267: http://www.fws.gov/pacific/bulltrout/final/pdf/Bull%20Trout%20CH%20FR%20notice.pdf

19. ESA-listed salmon and steelhead population delineations (termed by NMFS as an ESU, or Evolutionary Significant Unit) were obtained from data layers compiled by a GIS group from the Bonneville Power Administration, using written descriptions in National Marine Fisheries Service (NMFS) status reviews and mapping provided by NMFS. Drainage basin delineation and upstream barriers were based on 1:100,000 stream hydrography and available digital topography (1:250,000). General ESU maps can be found at the NMFS website: http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Maps/ .

20. Performance Results System (PRS) data was extracted from PRS reports by year, conservation systems, and practices by Hydrologic Unit Code (HUC) and Farm Bill Program. HUC level reports were not available where NA is listed. For additional information and other performance reports visit http://ias.sc.egov.usda.gov/prshome/ .

21. Ag Census data is from the National Agricultural Statistics Service (NASS) Website. For more information on individual census queries visit the NASS website at http://www.nass.usda.gov/. HUC specifica data was derived from the 2002 Agricultural Census and adjusted by percent of zip code area/county in the HUC.

22. Population ethnicity data were extracted from the Census 2000 Summary File 3 compiled by the U.S. Census Bureau for Washington State. For more information on census data and definitions visit http://www.census.gov/Press-Re lease/www/2002/sumfile3.html.

Footnotes and Bibliography

23. Urban population and median household income data were derived from the American FactFinder assembled by the U.S. Census Bureau. American FactFinder is a quick source for population, housing, income and geographic data. For other census items and trends visit http://factfinder.census.gov/home/saff/main.html?_lan .

24. Washington Department of Ecology website: http://www.ecy.wa.gov/biblio/wria03.html Publications listed by a Watershed Resource Inventory Area, WRIA 22, Lower Chehalis